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(54) Title: METHOD OF REDUCING OR PREVENTING MALODOUR

(57) Abstract

A method for reducing or preventing body malodour by topically applying to human skin perfume components capable of inhibiting the production of malodorous metabolites caused by micro-organisms comprising corynebacteria. The perfume components are capable of inactivating corynebacteria capable of catabolising fatty acids.

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METHOD OF REDUCING OR PREVENTING MALODOUR

This invention relates to perfume components, mixtures thereof and perfume compositions, to personal products and detergent products containing such perfumes, and to a method and the use of such perfumes and products to deliver a deodorant effect.

In particular, it relates to perfume components, mixtures thereof, and perfume compositions for inhibiting the production of odorous metabolites by topically applying to human skin perfumery components capable of inhibiting the production of body malodour caused by micro-organisms comprising corynebacteria, preferably by selectively inhibiting those corynebacteria capable of catabolising fatty acids.

It is well known that freshly secreted sweat is odourless and that body malodour is the result of a biotransformation of the sweat by micro-organisms living on the surface of the skin to produce volatile odoriferous compounds.

There are three types of personal product routinely used to combat body malodour: perfumes, antiperspirants and deodorants.

Perfumes may simply mask body malodour. However perfume compositions have been disclosed which exhibit a deodorant action. EP-B-3172, EP-A-5618, US-A-43044679, US-A-4322308, US-A-4278658, US-A-4134838, US-A-4288341 and US-A-4289641 all describe perfume compositions which exhibit a deodorant action when applied to human skin or when included in a laundry product used to launder textiles.

Antiperspirants work by blocking the sweat glands thereby reducing perspiration.

Antimicrobial agents used in deodorants are designed to reduce the population of micro-organisms living on the surface of the skin. Typical agents of this nature include ethanol and Triclosan (2,4,4'-trichloro-2'-hydroxy-diphenyl ether) which are well known to exert antimicrobial effects. The use of common deodorant actives results in a non-selective antimicrobial action exerted upon most of the skin's natural microflora. This is an undesirable side effect of such deodorant formulations.

Many disclosures describe compositions comprising antimicrobials which are designed to eliminate malodour by sub-lethally reducing the microflora population.

WO 95/16429 (Henkel) describes deodorant compositions comprising fat soluble partial esters of hydroxy carboxylic acids.

WO 95/07069, WO 91/11988 and WO 91/05541 (all Gillette) describe deodorant compositions comprising inhibitors of pyridoxal phosphate dependent amino acid lyase.

WO 94/14934 (Unilever) describes a method for reducing the perceptibility of an odoriferous substance using an antibody or antibody fragment. Such antibodies could be used in deodorant compositions.

WO 93/07853 (Monell) describes the use of mimics of the odoriferous compound 3-methyl-2-hexenoic acid to reduce body malodour.

DD 29 39 58 (Medezinische Fakultaet (Charite) der Humboldt Universitaet zu Berlin) describes the use of lipoxygenase inhibitors to act biochemically to reduce sweat production or to inhibit, to various degrees, the action of skin bacteria or their enzymes on the

decomposition of sweat to form unpleasant-smelling substances.

DE 43 43 265 (Henkel) describes deodorant compositions comprising saturated dioic acid (C3 - C10) esters. It is claimed that the active inhibits a sweat decomposing esterase and the compositions are said not to disturb the skin's natural microflora.

DE 43 43 264 (Henkel) describes the use of lipid-soluble partial esters of hydroxy carboxylic acids in deodorant compositions.

Some disclosures describe the use of antimicrobial substances which are selective against odour producing bacteria.

WO 90/15077 (Gillette) describes the use of antibodies to a carrier or transport protein of coryneform and staphylococci. It is disclosed that these bacteria types have an amino acid lyase enzyme which is responsible for the formation of malodour.

DE 43 39 605 (Beiersdorf) describes the use of deodorising mixtures of alpha-omega alkanedioic acids and fatty acid partial glycerides of unbranched fatty acids which may be present in a suitable cosmetic vehicle to combat Gram-positive, particularly coryneform, bacteria.

Woolwax acids have also been disclosed in the following Beiersdorf publications as deodorant actives in combination with:

-alpha-omega alkanedioic acids (DE 43 24 219);

-partial glycerides of unbranched fatty acids (DE 43 09 372); or

-monocarboxylic acids, especially unbranched fatty acids (DE 43 05 889).

Each combination is described as suitable to combat Gram-positive, especially coryneform bacteria.

DE 4237081 (Beiersdorf) describes deodorant compositions comprising monocarboxylic acid diglycerides and/or triglycerides. The compositions are said to be suitable against Gram-positive, especially coryneform, bacteria.

EP-A-0 697 213 (Beiersdorf) describes the selective reduction of coryneform bacteria using a mixture of:

-lauric acid;

-one other fatty acid C6 - C20 (one of which must be at least C12);

-glyceryl monocaprate/glyceryl monocaprylate;

-without the use of ethoxylated glyceryl fatty acid esters and propoxylated glyceryl fatty acid esters;

which has a pH of less than 8.

WO 94/07837 (Unichema) describes certain novel unsaturated dioic acids having between 8 and 22 carbon atoms. Also described is their potential use to treat malodour.

EP-A-0 750 903 (Cooperatie Cosun UA) discloses deodorant compositions comprising sugar-fatty acid esters. The actives are described as being selective towards odour causing micro-organisms. These odour-causing micro-organisms are said to be the Corynebacterium varieties known as lipophilic diphtheroids such as *Corynebacterium xerosis* and *C. minutissimum.*

Coryneform is a designation of a large ill-defined group of bacteria. The diverse genera that have been included with the coryneforms include Actinomyces, Arachnia, Arcanobacterium, Arthrobacter, bacterionema, Bifidobacterium, Brevibacterium, Cellulomonas, Corynebacterium, Eyrsipelothrix, Eubacterium, Kurthia, Listeria, Mycobacterium, Nocardia, Oerskovia, Propionibacterium, Rhodococcus and Rothia.

It is clear that the majority of previous disclosures in this area have been aimed at antibacterial or bacteriostatic effects towards the whole skin flora or selected species.

Without being bound by theory we believe that the *Corynebacterium* genus can be subdivided into two subgroups according to ability to catabolise fatty acids. We further believe that one of these subgroups, hereinafter referred to as "Corynebacteria A", which is capable of catabolising fatty acids, contributes strongly to the formation of body malodour, in particular axillary malodour. The other subgroup, hereinafter referred to as "Corynebacteria B", which catabolises fatty acids much less so or not at all, contributes much less or even not at all to malodour formation. We also believe that it is possible to selectively inhibit the generation of odorous metabolites by Corynebacteria A.

The deodorants available on the market tend to be insufficiently effective and/or substantially reduce the numbers of all bacteria in the microflora indiscriminately. The present invention offers the opportunity to provide deodorant products which for many females will substantially reduce malodour formation while inhibiting only a minor portion of the microflora. For many males malodour formation can be substantially reduced or even largely eliminated by inactivating the Corynebacteria A.

Furthermore, we have found a range of perfume components capable of selectively inactivating Corynebacteria A, while leaving other bacteria, notably Corynebacteria B much less affected or even not notably affected at all. Significant deodorant action can be obtained by the action of these components singly or in combination.

Accordingly, the invention provides a cosmetic method for reducing or preventing body malodour by topically applying to human skin a composition comprising an active agent capable of inactivating body malodour-causing micro-organisms comprising corynebacteria, wherein the agent is a perfume component which is capable of inactivating the corynebacteria capable of catabolising fatty acids.

The invention also provides the use of a perfume component to inactivate the corynebacteria capable of catabolising fatty acids.

The invention further provides the use of a perfume composition, comprising at least 30% by weight of one or more perfume components capable of inactivating the corynebacteria capable of catabolising fatty acids, to reduce body malodour.

The invention further provides the use of a deodorant product comprising a perfume component to reduce body malodour by inactivating the corynebacteria capable of catabolising fatty acids.

The invention further provides a perfume composition comprising at least 30% by weight of one or more of the following perfume components;

(Z)-3,4,5,6,6-pentamethylhept-3-en-2-one, mixtures of diethyl- and dimethyl-cyclohex-2-en -1-one, citronellol, 2-methyl-3-(4-(1-methylethyl)phenyl)propanal, (2-(methyloxy)-4-propyl -1-benzenol), diphenylmethane, tetrahydrolinalol, 4-(4-methyl-3-pentenyl)cyclohex-3-ene -1-carbaldehyde, 3-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde, 3-(1,3-benzodioxol -5-yl)-2-methylpropanal, α-ionone, β-ionone, tricyclo[5.2.1.0,2,6]dec-4-en-8-yl ethanoate, 4-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde, 3-(4-hydroxy-4-methylpentyl) -cyclohex-3-enecarbaldehyde, methyl iso-eugenol, 2-(1,1-dimethylethyl)cyclohexyl ethanoate, 4-(1,1-dimethylethyl)cyclohexylethanoate, 4-methyl-2-(2-methylprop-1-enyl) tetrahydropyran, and a deodorant product comprising such a perfume composition.

The invention still further provides a method of producing a perfume composition which comprises (i) evaluating perfume components on the ability to inhibit fatty acid metabolism in corynebacteria, (ii) selecting perfume components on the ability to sub-lethally inhibit fatty acid metabolism in corynebacteria, and (iii) mixing together two or more of said selected perfume components, optionally with other perfume components.

The term "perfume component" is used herein to represent a material which is added to a perfume to contribute to the olfactive properties of the perfume. A perfume component can be acceptably employed to provide odour contributions to the overall hedonic performance of products. Typically, a perfume component will be generally recognised as possessing odours in its own right, will be relatively volatile and often has a molecular weight within the range 100 to 300. Typical materials which are perfume components are described in "Perfume and Flavour Chemicals", Volumes I and II (Steffan Arctander, 1969). A perfume composition will contain a number of individual perfume components, and optionally a suitable diluent. The concentration of perfume components referred to herein is relative to the total concentration of perfume components present in the composition, ie excludes any diluent.

The perfume components used in the present invention are capable of inactivating Corynebacteria, preferably selectively inactivating Corynebacteria A. By inactivate is meant any sub-lethal effect resulting in a reduction or elimination of the production of odoriferous metabolites, eg by modification of bacterial metabolism, such as fatty acid metabolism. The sub-lethal effect of a perfume component preferably occurs at concentrations below its minimum inhibitory concentration, determined as decribed in Example 2 below.

In particular, by sub-lethal is meant a significant inhibition of metabolism, e.g. pentadecanoic acid utilisation (at least 60% inhibition), preferably without concomitant reductions in cell viability (not more than 1 $\log_{10}$ CFU/ml reduction) and glucose utilisation (not more than 10% reduction).

The perfume components used in the present invention may be incorporated into deodorant products which include, but are not limited to, body deodorants and antiperspirants including roll ons, gel products, stick deodorants, antiperspirants, shampoos, soap shower gels, talcum powder, hand cream, skin conditioners, sunscreen, sun tan lotion, skin and hair conditioners.

The perfume components may also be usefully employed for deodorant properties by incorporation into other products, for example, in laundry and household products such as

rinse conditioners, household cleaners and detergent cleaners. The perfume components can be incorporated into textiles themselves during their production using techniques known in the art, to provide deodorant protection.

It is postulated that the preferred selective inhibition of Corynebacteria A is achieved by inhibiting the metabolic pathways of the Corynebacteria A which leads to a reduction in the production of malodorous metabolites. The inhibition of the metabolic pathway of Corynebacteria A is more important than the inhibition of the metabolic pathway of Corynebacteria B, as only the Corynebacteria A are capable of producing malodorous products.

In a preferred method according to the invention, perfume components which selectively inhibit the metabolic pathway of only those corynebacteria capable of catabolising fatty acids are used, by which is meant inactivating Corynebacteria A to a significantly higher degree than Corynebacteria B. Preferably, it means inactivating Corynebacteria A to a significantly higher degree than the majority, preferably at least 75%, more preferably at least 90% of bacteria, other than Corynebacteria A constituting the skin microflora.

The levels of perfume materials used in a skin product may lead to general bacteriostatic and bactericidal effects. A skilled person responsible for formulating a finished product will be able to adjust the level to produce the desired effect in the final product.

The perfume components employed in the present invention are more active with Corynebacteria A than with other bacteria constituting the axillary microflora, including Corynebacteria B, when considering the selective inhibition of the metabolic pathway of the bacteria, particularly in respect of fatty acid metabolism.

The active perfume components preferably selectively inhibit the metabolic pathway of Corynebacteria A, leading to a reduction of malodorous compounds, producing a deodorant effect in consumer products. In a preferred method according to the invention, an Odour Reduction Value, measured as described in Example 4, of at least 10%, more preferably at least 30%, and particularly at least 50% is obtained. The active components may be mixed with other perfume components to deliver perfumes or perfume compositions with the desired deodorant and hedonistic properties. To deliver high deodorant effects the active components preferably comprise 30% or more of the total perfume formulation by weight, more preferably at least 40% and particularly at least 60%. A deodorant product preferably comprises at least 0.05% to 4%, more preferably 0.1% to 2% by weight of the active perfume components. Preferred actives include the following perfume components.

(Z)-3,4,5,6,6-pentamethylhept-3-en-2-one (Acetyl di iso amylene)

Mixture of diethyl- and dimethyl-cyclohex-2-en-1-one (Azarbre)

Citronellol

2-methyl-3-(4-(1-methylethyl)phenyl)propanal (Cyclamen aldehyde)

(2-(methyloxy)-4-propyl-1-benzenol) (Dihydroeugenol)

Diphenylmethane

Tetrahydrolinalol

4-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde (Empetaal)

3-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde (Empetaal)

3-(1,3-benzodioxol-5-yl)-2-methylpropanal (Helional)

α- and β-Ionone and mixtures thereof (Ionone)

tricyclo[5.2.1.0 2,6]dec-4-en-8-yl ethanoate (Jasmacylene)

4-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde (Lyral)

3-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde (Lyral)

Methyl iso-eugenol

2-(1,1-dimethylethyl)cyclohexyl ethanoate (Ortholate)

4-(1,1-dimethylethyl)cyclohexyl ethanoate (Ortholate)

4 -Methyl-2-(2-methylprop-1-enyl)tetrahydropyran (Rose oxide)

A perfume composition for use in the present invention preferably comprises at least 5, more preferably at least 10, and particularly at least 15 of the above perfume components.

The invention is illustrated by the following examples.

EXAMPLE 1

A demonstration of fatty acid catabolism in an isolated pure culture of Corynebacterium A deposited as NCIMB 13590 (deposited under the Budapest Treaty with National Collections of Industrial and Marine Bacteria Ltd, 23 St Machar Drive, Aberdeen Scotland, UK on 28 June 1999) was determined *in vitro* using the method given below:

The *in vitro* model system, reproducing fatty acid catabolism by axillary bacteria, consisted of 250 ml baffled shake flasks, to which were added 30 ml semi-synthetic medium (see below) supplemented with fatty acid substrate (2.0 mg/ml pentadecanoic acid) This system was employed to evaluate selected potential deodorant actives (see below). Flasks were inoculated with fresh bacterial biomass, pre-grown for 24 h in TSBT (see below), to give starting optical densities (A_{590}) of 1.0 - 2.0. Following inoculation, flasks were incubated aerobically at 35°C, with agitation (130 rpm), and analysed after 24 h. Culture viability/purity was determined by TVC analysis on TSAT plates (see below) following serial dilution in quarter-strength Ringers solution.

Fatty acid levels in the flasks were determined by capillary gas chromatography (GC) analysis. Initially, 5.0 ml aliquots from each flask were rapidly transferred into universal tubes; an internal standard (1.0 mg/ml lauric acid) was added to each universal tube and the culture medium was acidified (pH ~2) by the addition of hydrochloric acid. Liquid-liquid extraction was then carried out using 2 vol (10 ml) ethyl acetate; organic and aqueous phases were resolved by centrifugation (2000 rpm, 3 min). 2.0 ml of each organic (upper) phase was then transferred to a sampling tube prior to analysis on a Perkin Elmer 8000 (Series 2) GC fitted with a 15 m x 0.32 mm (internal diameter) FFA (nitroterephthalic acid modified PEG/siloxane copolymer) fused silica capillary column (film thickness 0.25 mm) (Quadrex). This column was attached to the split splitless injector and flame ionisation detector (FID) of the GC ; injector and detector temperatures were each 300°C. Carrier gas for the column was helium (6.0 psi), while hydrogen (17 psi) and air (23 psi) were supplied the FID. The temperature programme for fatty acid analysis was 80°C (2 min); 80-250°C (20°C/min); 250°C (5 min). Sample size for

injection was 0.5 -1.0 μl. Fatty acid levels in the flasks were quantified by comparison of peak areas with known levels of both internal (lauric acid) and external (pentadecanoic acid) standards.

EXAMPLE 2

The minimum inhibitory concentration of perfume components was determined by the following method.

A fresh culture of of the test inoculum (Corynebacteria xerosis NCTC 7243 (National Collection of Type Cultures, Public Health Laboratory Service, Central Public Health Laboratory , 61 Colindale Avenue, London)) diluted in sterile 0.1% special peptone solution to give a concentration of approximately 10^6 cfu/ml was prepared.

Test samples were diluted in sterile trptone soya broth (TSB) Each row of the microtitre plate (labelled A - H) was allocated to one sample, i.e. eight samples per plate. Row 8 (H) contained only TSB for use as a bacterial control to indicate level of turbidity in the absence of test material. Aseptically 200 μl of the initial dilution was transferred to the 1st and 7th well of the appropriate row. All other test wells were filled with 100 μl of sterile TSB using an 8 channel pipette. The contents of all wells in column 1 were mixed by sucking samples up and down pipette tips before 100 μl was transferred to column 2. The same sterile pipette tips can be used to transfer 100 μl of each well in column 7 in to the appropriate well in column 8. Tips were discarded into disinfectant solution. Using fresh sterile tips the process was repeated by transferring 100 μl from column 2 into column 3 (and 8 into 9). The process was continued until all wells in columns 6 and 12 contained 200 μl. After mixing 100 μl was discarded from wells in these columns to waste.

To all wells 100 μl of pre-diluted test culture was added giving 200 μl final volume in each well.

A blank plate was prepared for each set of samples using the above protocol except 100 μl of sterile 0.1% peptone was added instead of bacterial culture.

Plates were sealed using autoclave tape and incubated overnight at 35° C.

The reader was preset to gently agitate the plates to mix the contents before reading absorbance at 540 nm. The control plate for each set of samples was read first. The reader was then reprogrammed to use the control readings to blank all other plate readings of the set of test materials (i.e. removing turbidity due to perfume and possible colour changes during incubation) thus only printing out absorbances due to turbidity resulting from bacterial growth. Limits were set so that degrees of turbidity were given a rating.

The MIC was taken as the level of sample required to inhibit growth completely (change in absorbance < 0.2).

EXAMPLE 3

Demonstration of sub-lethal inactivation of fatty acid catabolism was performed with the following in *vitro* method.

Prior to inoculation, flasks were supplemented with selected perfume components, at a range of concentrations (eg 500 ppm and 1000 ppm) below their predetermined minimum inhibitory concentration, to determine their ability to sub-lethally inhibit fatty acid catabolism by

Corynebacteria A (NCIMB 13590). Stock active solutions/emulsions were prepared in semi-synthetic medium (see below), emulsions were formed by ultra-homogenisation at 24,000 rpm for ~1 min. At the end of each experiment, viability and fatty acid levels in the experimental flasks were compared to those in a control flask. Sub-lethal inhibition of fatty acid catabolism was defined as significant inhibition of pentadecanoic acid utilisation, without concomitant reductions in cell viability.

Composition of Tween-supplemented Tryptone soya broth/agar (TSBT, TSAT) used for growth/maintenance of axillary bacteria (g/l) :Tryptone soya broth (30.0), Yeast extract (10.0), Tween 80 (1.0), ± Agar (20.0). Composition of semi-synthetic medium used in laboratory systems simulating fatty acid catabolism by axillary bacteria (g/l): KH_2PO_4 (1.6), $(NH_4)_2HPO_4$ (5.0), Na_2SO_4 (0.38), Yeast Nitrogen Base (Difco) (3.35), Yeast Extract (0.5), Tween 80 (0.2), Triton X-100 (0.2), $MgCl_2.6H_20$ (0.5), Pentadecanoic acid (2.0).

The results below show the perfume components that are active and inactive with regard to the inhibition of fatty acid metabolism in Corynebacteria A.

Inhibition of long chain fatty acid metabolism observed	**No inhibition of long chain fatty acid metabolism observed**
(Z)-3,4,5,6,6-pentamethylhept-3-en-2-one	Aldehyde C11
Mixture of diethyl- and dimethyl-cyclohex-2-ene-1-one	Anisic Aldehyde
2-methyl-3-(4-(1-methylethyl)phenyl) propanal	Caryophyllene
(2-(methyloxy)-4-propyl-1-benzenol)	Cinnamic alcohol
Diphenylmethane	2H-2-chromenone
4-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde	
3-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde	Florocyclene 3a,4,5,6,7,7a-hexahydro-4,7-methano-1H-inden-6-yl propanoate
3-(1,3-benzodioxol-5-yl)-2-methylpropanal	4,6,6,7,8,8-hexamethyl-1,3,4,6,7,8-hexahydrocyclopenta[gamma]isochromene
Mixture of alpha and beta ionone	Hexyl cinnamic aldehyde
4-(4-hydroxy-4-methylpentyl)cyclohex-3-ene carbaldehyde	
3-(4-hydroxy-4-methylpentyl)cyclohex-3-ene carbaldehyde	hexyl 2-hydroxy-1-benzene carboxylate

Methyl-iso-eugenol	Iso-e-super
2-(1,1-dimethylethyl)cyclohexyl ethanoate	Lilial
4-Methyl-2-(2-methylprop-1-enyl)-tetrahydropyran	Thyme red

EXAMPLE 4

The following are typical formulations of deodorant products which comprise a perfume or perfume component capable of inhibiting the production of body malodour by micro-organisms comprising Corynebacteria. These formulations are made by methods common in the art.

Deodorant Sticks

Ingredient	Content (% by weight)	
	Formulation 1A	Formulation 1B
Ethanol		8
Sodium Stearate	7	6
Propylene glycol	70	12
Perfume	1.5	2
PPG-3 Myristyl ether		28
PPG-10 Cetyl ether		10
Cyclomethicone		34
Silica		
Water	21.5	

Aerosols

Ingredient	content % by weight	
	Formulation 2A	Formulation 2B
Ethanol B	up to 100	
Propylene glycol	as required	
Perfume	2.5	1.5
Chlorhydrol microdry		31.8
Silicone Fluid DC344		up to 100
Bentone gel IPP		13.65

Irgasan DP300	0.03	
Dimethyl ether	20	
Concentrate		22
Water	23	

Roll ons

Ingredient	Content % by weight	
	Formulation 3A	Formulation 3B
Ethanol	to 100%	60
Klucel MF		0.65
Cremphor RM410		0.5
Perfume	0.5	1
AZTC*	20	
Cyclomethicone	68	
Dimethicone	5	
Silica	2.5	
Water		37.85

* Aluminium zirconium tetrachlorohydro glycinate

Two perfume compositions embodying this invention were made and tested for deodorant action in an underarm product, using an Odour Reduction Value test generally as described in US-A-4278658, but with the substitution of the perfumed soap by perfumed roll-on product, using the formulation described in Formulation 3B. These perfume compositions and the method for an Odour Reduction Value test are set out below.

	Composition by %	
	Perfume A	Perfume B
Acetyl di iso amylene	10	7
Adoxal		0.5
Amberlyn super PM 577 10%DPG	3	
Azarbre	3.5	
Benzyl acetate extra	8	8
Benzyl salicylate	8	12

Cassis base		5
Citral lemarome		3
Citronellol pure		15
Cyclamen aldehyde		5
Dihydro jasmone	0.5	
Diphenyl methane	3	
Dupical		0.3
Helional		4
Ionone	15	
Jasmacyclene	3	
Ligustral 10%DPG AAA 1486	3	
Lyral	8	15
Methyl iso eugenol	5	
Methyl octyl acetaldehyde 10%DPG AA1918		2
Ortholate		8
Para tert butyl cyclo hexyl acetate	12	
Phenyl ethyl alcohol	12	13
Roseacetone	6	2.2

The Odour Reduction Value test was carried out using a panel of 40 Caucasian male subjects. A standard quantity (approximately 0.4g) of a roll-on product containing one of the perfume compositions or an unperfumed control was applied to the axillae of the panel members in accordance with a statistical design.

After a period of five hours the axillary odour was judged by three trained female assessors who scored the odour intensity on the 0 to 5 scale, as shown below.

Score	Odour level	Conc. of aqueous isovaleric acid (ml/l)
0	No odour	0
1	Slight	0.013
2	Definite	0.053
3	Moderate	0.22
4	Strong	0.87

5	Very Strong	3.57

Average scores for each test product and the control product were then determined and the score for each test product was subtracted from the score for the control product to give the Odour Reduction Value.

Average panel score perfume A	2.08
Control panel score	2.31
Odour Reduction Value perfume A	0.23
Odour Reduction Value as percentage of control score	10%

Difference for significance @95% 0.21
Difference for significance @99% 0.28

Average panel score perfume B	1.98
Control panel score	2.31
Odour Reduction Value perfume B	0.33
Odour Reduction Value as percentage of control score	14%

Difference for significance @ 95% 0.21
Difference for significance @ 99% 0.28

Perfume A contained 47.5% and perfume B contained 54% of active perfume components.

CLAIMS

1. A cosmetic method for reducing or preventing body malodour by topically applying to human skin a composition comprising an active agent capable of inactivating body malodour-causing micro-organisms comprising corynebacteria, wherein the agent is a perfume component which is capable of inactivating the corynebacteria capable of catabolising fatty acids.

2. A method according to claim 1 wherein the composition is a perfume composition comprising at least 30% by weight of one or more of the perfume components capable of inactivating the corynebacteria capable of catabolising fatty acids.

3. A method according to either one of claims 1 and 2 wherein the perfume component comprises at least one of the following materials (Z)-3,4,5,6,6-pentamethylhept-3-en-2-one, mixtures of diethyl- and dimethyl-cyclohex-2-en-1-one, citronellol, 2-methyl-3-(4-(1-methylethyl)phenyl)propanal, (2-(methyloxy)-4-propyl-1-benzenol), diphenylmethane, tetrahydrolinalol, 4-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde, 3-(4-methyl-3-pentenyl)cyclohex-3-ene-1-carbaldehyde, 3-(1,3-benzodioxol -5-yl)-2-methylpropanal, α-ionone, β-ionone, tricyclo[5.2.1.0,2,6]dec-4-en-8-yl ethanoate, 4-(4-hydroxy-4-methylpentyl)cyclohex-3-enecarbaldehyde, 3-(4-hydroxy-4-methylpentyl)- cyclohex-3-enecarbaldehyde, methyl iso-eugenol, 2-(1,1-dimethylethyl)cyclohexyl ethanoate, 4-(1,1-dimethylethyl)cyclohexyl ethanoate, 4-methyl-2-(2-methylprop-1-enyl)tetrahydropyran.

4. A method according to any one of the preceding claims wherein an Odour Reduction Value of at least 10% is obtained.

5. A method according to any one of the preceding claims wherein the perfume component inactivates the corynebacteria capable of catabolising fatty acids.

6. The use of a perfume component to inactivate the corynebacteria capable of catabolising fatty acids.

7. The use of a perfume composition, comprising at least 30% by weight of one or more perfume components capable of inactivating the corynebacteria capable of catabolising fatty acids, to reduce body malodour.

8. The use of a deodorant product, comprising a perfume component, to reduce body malodour by inactivating the corynebacteria capable of catabolising fatty acids.

9. A perfume composition comprising at least 30% by weight of one or more of the perfume components listed in claim 3.

10. A deodorant product comprising a perfume composition defined in claim 9.

11. A method of producing a perfume composition which comprises (i) evaluating perfume components on the ability to inhibit fatty acid metabolism in corynebacteria, (ii) selecting perfume components on the ability to sub-lethally inhibit fatty acid metabolism in corynebacteria, and (iii) mixing together two or more of said selected perfume components, optionally with other perfume components.

12. A method according to claim 11 wherein the selected perfume components are one or more of the perfume components listed in claim 3.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/02165

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 A61K7/32 A61K7/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 554 588 A (BEHAN JOHN M ET AL) 10 September 1996 (1996-09-10) abstract column 1, line 60 -column 2, line 3 examples 5-8 column 16, line 1 -column 17, line 9 claims 12,20,21	1-4,9,10
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Y		3

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 November 1999	16/11/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Cielen, E

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Int'l Application No
PCT/GB 99/02165

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	MORRIS J A ET AL: "ANTIMICROBIAL ACTIVITY OF AROMA CHEMICALS AND ESSENTIAL OILS" JOURNAL OF THE AMERICAN OIL CHEMISTS' SOCIETY, 1 May 1979 (1979-05-01), pages 595-603, XP000645444 ISSN: 0003-021X page 595, paragraph 1 - paragraph 3 table III	3
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Information on patent family members

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